INVESTIGATION OF THE INTERACTIONS BETWEEN THE SOYBEAN PLANTS AND MICROORGANISMS USING STABLE ISOTOPES

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The expanding body of research on the health benefits associated with pulse consumption has heightened interest in cultivating legumes, even in cooler climate regions like Lithuania. Although they are sensitive to climatic stresses, resulting in inferior-quality seeds. To solve this problem, there is a need for better management tools for nitrogen fixation in legumes. In turn, microorganisms and biostimulants can increase nitrogen fixation in legumes, and contribute to better seed quality formation. However, the relationship between plants and microorganisms in the rhizosphere exhibits complexity and diversity. Stable isotope probing presents a unique opportunity to observe subtle alterations in the nitrogen signature within plants, resulting from the utilization of diverse nitrogen sources. This technique allows for the precise tracking and analysis of even minor changes in the isotopic composition of nitrogen in plant tissues, enabling to discern variations arising from different nitrogen inputs or sources (in this case atmospheric N_2 or dissolved nitrogen in soil).

Our preliminary study of two varieties of soybeans (Laulema and Merlin) infected by two strains of microorganisms (Bactolife and Rhizofix 10) using the natural abundance of ^{15}N (defined as delta^{15}N) shows the effectiveness of these microorganisms in N_2 fixation, also related with higher nitrogen content (Fig. 1). The nitrogen isotopic ratio up to $\tilde{2}$ ‰ shows the main sources of atmospheric nitrogen, meanwhile higher isotopic values reflect the input of nitrogen fertilizers. Thus, we demonstrated the potential of two strains of symbiotic microorganisms to better management practices for the cultivation of non-traditional legume species like soybean.

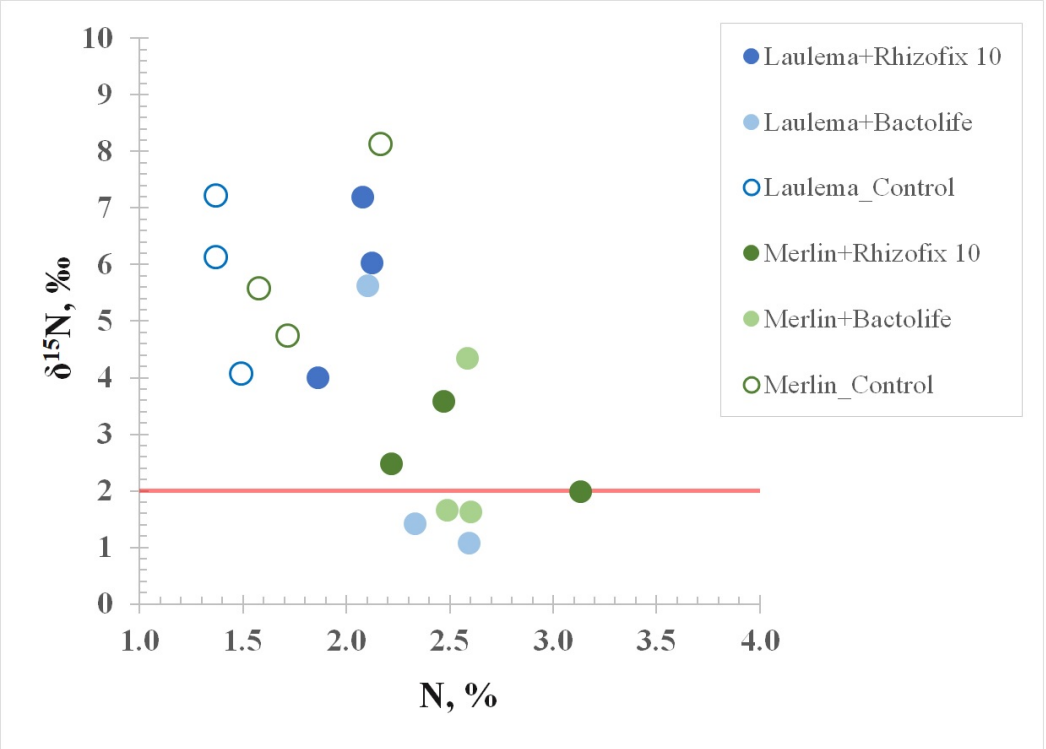

Fig. 1. Nitrogen stable isotope values (delta^{15}N) and nitrogen content (N, %) in two varieties of soybeans (Laulema and Merlin) infected by two strains of microorganisms (Bactolife and Rhizofix 10).

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